SUMMER– 15 EXAMINATION

Subject Code: **17537** **Model Answer**

Important Instructions to examiners:

1) The answers should be examined by key words and not as word-to-word as given in the model answer scheme.

2) The model answer and the answer written by candidate may vary but the examiner may try to assess the understanding level of the candidate.

3) The language errors such as grammatical, spelling errors should not be given more Importance (Not applicable for subject English and Communication Skills.

4) While assessing figures, examiner may give credit for principal components indicated in the figure. The figures drawn by candidate and model answer may vary. The examiner may give credit for any equivalent figure drawn.

5) Credits may be given step wise for numerical problems. In some cases, the assumed constant values may vary and there may be some difference in the candidate's answers and model answer.

6) In case of some questions credit may be given by judgement on part of examiner of relevant answer based on candidate's understanding.

7) For programming language papers, credit may be given to any other program based on equivalent concept.

Q.1 A) Attempt any THREE **12 marks**

a) Compare between woofer, tweeter and squawker on the basis of following parameters.

i) Frequency response

ii) Cross over network

iii) Cost

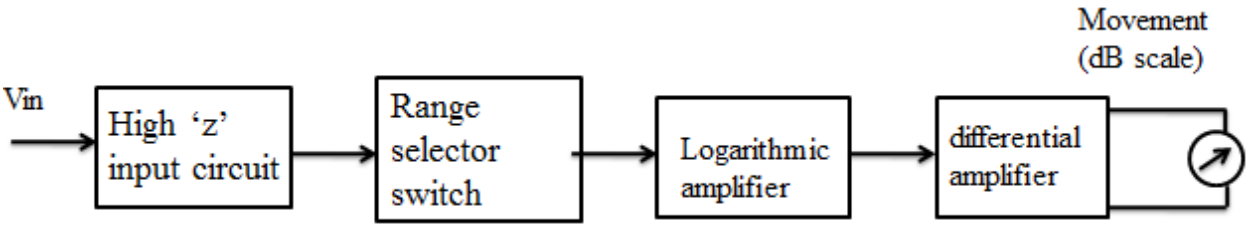
iv) Application

Ans: **(Correct points – 1 mark each)**

Parameter	Woofer	Tweeter	Squawker
Frequency Response	Attenuation beyond the cut-off frequencies is 12dB per octave	Attenuation before the cut-off frequencies is 12dB per octave.	It operates between the cut-off frequencies of woofer and tweeter.
Cross over network	2 way & 3 way network	2 way & 3 way network	Only 3 way network
Cost	High	Low	Moderate
Application	They are used in PA system as they have high efficiency.	They are electrodynamics drivers.	TV sets and cheap radio sets have mid-range speakers.

b) Draw the block diagram of dB meter with neat label.

Ans: **(correct diagram – 4 marks)**



c) Define the following points;

i) Contrast

ii) Luminance

iii) Hue

iv) Saturation

Ans: **(correct definition – 1 mark each)**

1. Contrast: **(1 Mark)**

This is the difference in light intensity between black and white parts of the picture over the average brightness level.

2. Luminance: **(1 Mark)**

Luminance is the amount of light intensity or the total amount of light energy that is received by the eye irrespective of the colour of light. In monochrome TV, better lighted parts have more luminance than dark areas and different colours have shades of luminance.

3. Hue **(1 Mark)**

This is the predominant spectral colour of received light which means it is the actual colour seen by the eye. Red, Green, Blue, Yellow, Magenta, represent different in the visible spectrum.

4. Saturation **(1 Mark)**

- **It re**presents the spectral purity of a colour light. It is the amount of white light that is mixed with a colour.
- A fully saturated colour will have no white light mixed with it.
- For example, a Pure Red without White is a saturated colour.

d) State any four advantages of vacuum fluorescent display.

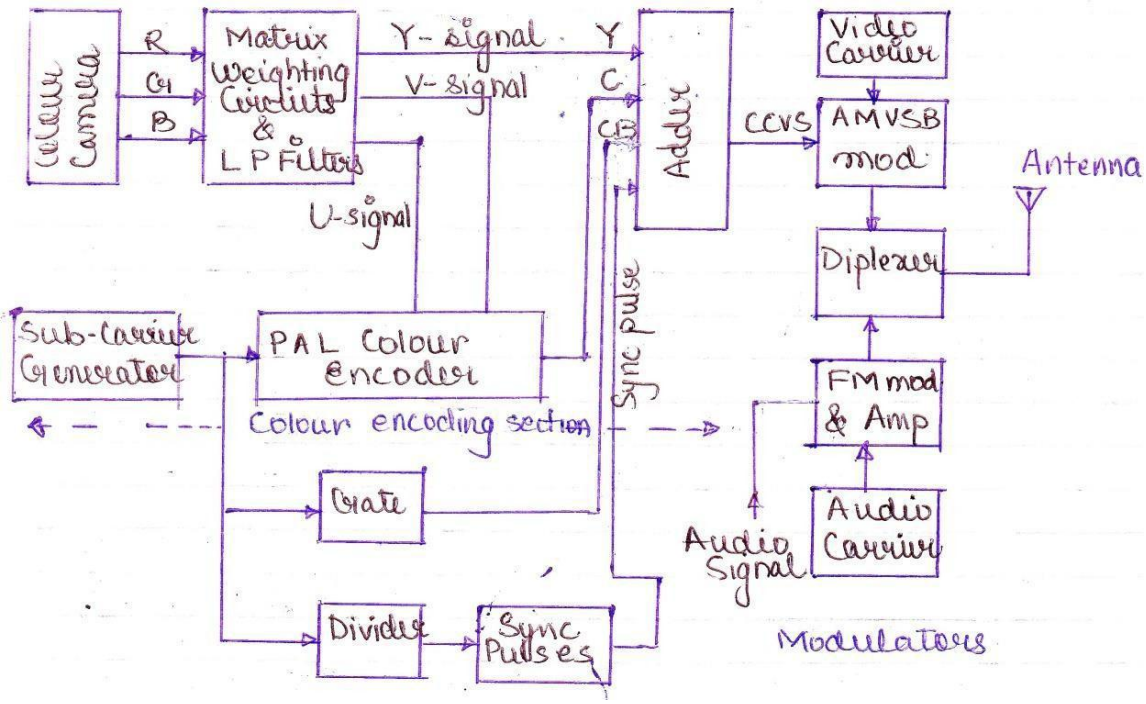
Ans: **(any four advantages – 1 mark each)**

- Displays the pitch of the channel, band etc.
- Helps the listener to adjust the pitch of his interest by seeing the display.
- Helps to know the voice band when using the karaoke system.
- Uniform brightness, low cost etc.
- In addition to ten numerals, the display can be used to show letters including punctuation.
- It gives hexadecimal encoding for display the digits 0 to F.
- To remove the ambiguity letter 'B' is small 'b' and number '8' is in 7 segment display, otherwise both would have looked same.
- It can give short message giving status information in CD player like "no disc" or "error" etc.
- The fluorescent numbers and messages can be seen in the dark also.

Q.1 B) Attempt any ONE **6 marks**

a) Draw the block diagram of Colour TV transmitter and write the function of each block.

Ans: **(correct diagram – 3 marks, explanation – 3 marks)**



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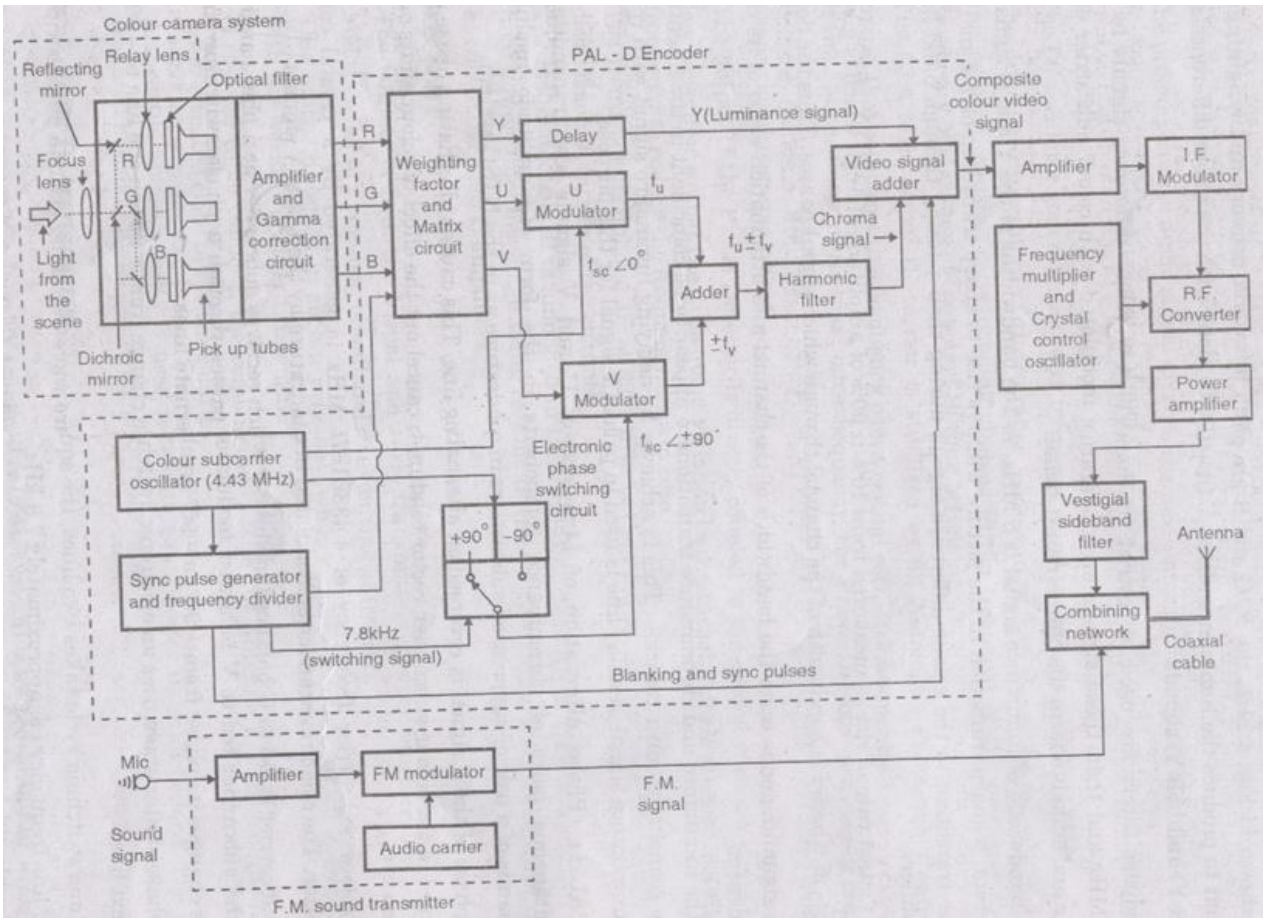


A PAL colour TV transmitter consists of following three main sections.

1. Production of Luminance (Y) and Chrominance (U and V) signals:

Colour camera tube produces R, G and B voltages pertaining to the intensity of red, green and blue colours respectively in pixels.

The luminance signal Y is obtained by a resistive matrix, using grass man's law. **Y=0.3R+0.59G+0.11B.**

For colour section Y is inverted colours R and B obtained from the colour camera tubes are added to it to get (R-Y) and (B-Y) colour difference signal.

These signals are weighted by two resistive matrix network which gives „U" and „V" signals as **U=0.493 (B-Y) & V=0.877(R-Y)**

2. PAL encoder:

PAL switch which operates electronically at 7812.5Hz with the help of Bistable multivibrator and feeds the sub-carrier to balanced modulator with phase difference of +900 on one line and -900 on the next line.

The PAL encoder consists of a sub carrier generator and two balanced modulator with filters to produce modulated sub carrier signal. These signals are added vertically to give Chroma signal (C).

Then Chroma signal is mixed with Y signal along with sync and blanking pulses to produce Colour Composite Video Signal (CCVS).

3. **Video and Audio modulators and transmitting antenna**:

CCVS amplitude modulates the main video carrier. It is followed by a sharp VSB filter to attenuate the LSB to give AMVSB signal for transmitter.

Audio signal modulates separate carrier. This modulation is FM type.

AMVSB video signal along with audio signal passes to the transmitting antenna through Diplexer Bridge which is a whetstones bridge.

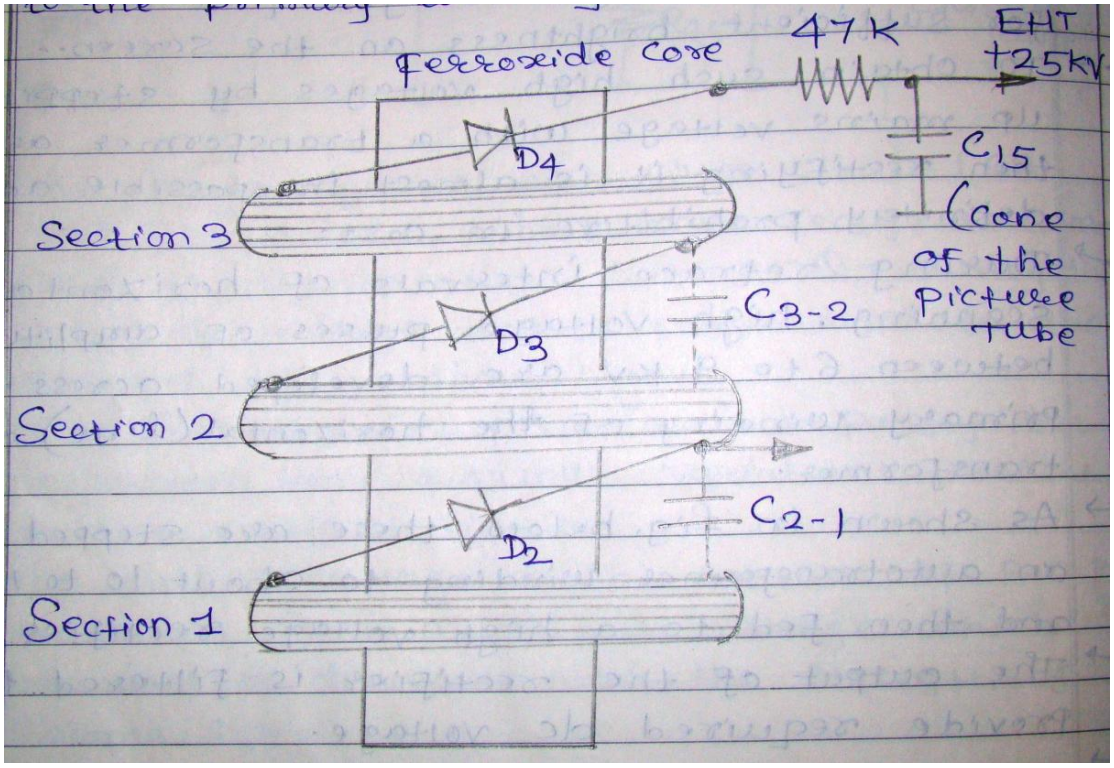
b) What is EHT? Describe its need. Draw the circuit diagram for EHT generation using diode split addition technique.

Ans: **(correct diagram – 3 marks, EHT definition – 1 mark, need – 2 marks)**

EHT is a voltage generator, which generates around 17KV for B/W TV & 25KV for colour TV using the principle of auto transformer action V=L di/dt

Need of EHT: - It is used to generate high voltage which acts as a anode voltage for picture tube. This picture tube has inner coating called aquading coating & outer coating as graphic coating which acts as a capacitor, that charges during the horizontal retrace even.

In order to strike the electron on the face plate of the picture tube, we need to accelerate the electron which will be attracted by high voltage.



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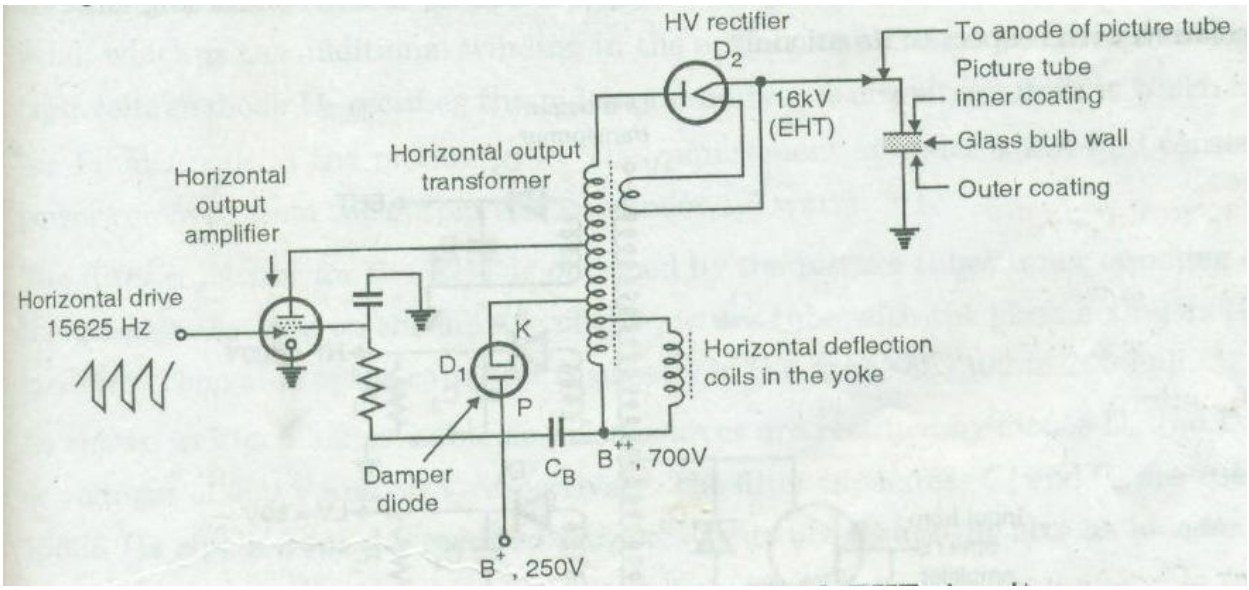


Q.2 Attempt any FOUR **16 marks**

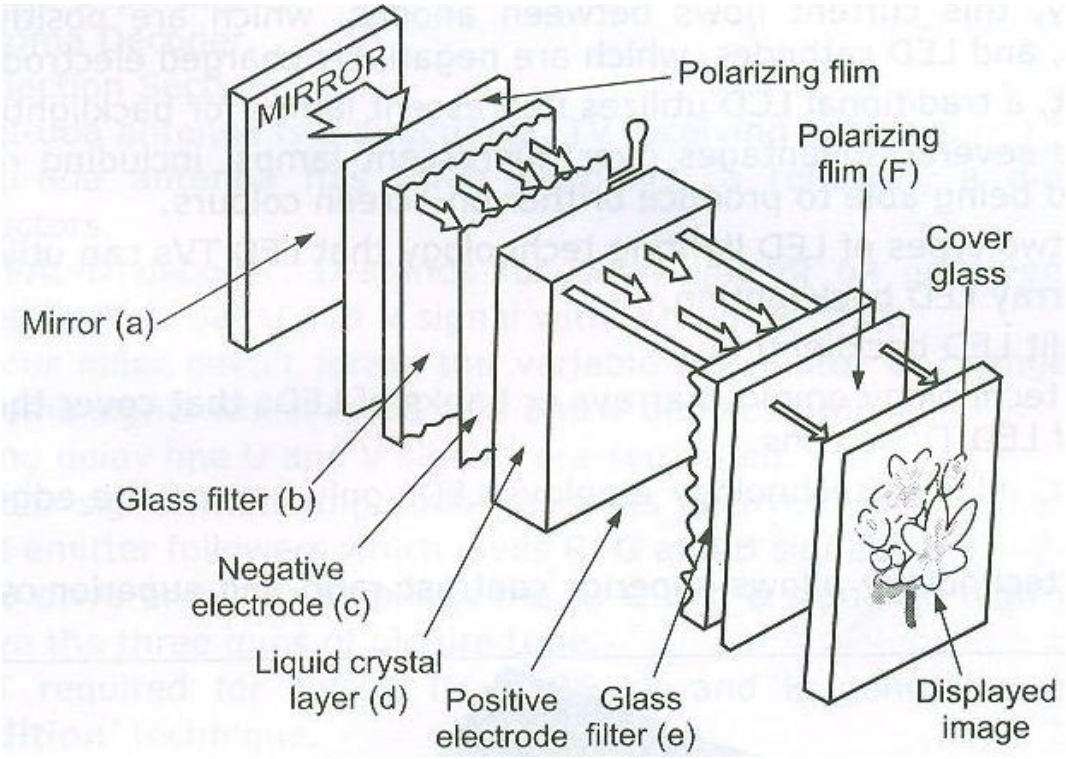
a) Describe the principle of LCD with neat sketch.

Ans:

Working Principle **(1 Mark)**

LCD TV has two sheets of polarized glass plates with some Liquid Crystal Solution trapped between them, forcing the liquid crystal into a twisted structural arrangement.

Diagram: **(2 marks)**



Working **(1 Mark)**

- LCD TV uses the LCD Display technology to produce images.
- LCD is a form of visual display technology that functions by sandwiching a layer of liquid crystals between two transparent electrodes or conductive surfaces.
- Liquid Crystals are specialized molecules that flow like liquids but polarize light like solid, crystalline structures.
- LCD technology works by selective passage of light, which passes through millions of individual LCD structures.
- These shutters are arranged in grids and constitute coloured filters, allowing only the RGB portion of the light to pass through white light are typically provided by a series of CCFLs (Cold Cathode Fluorescent Lamps), which are rear of the screen.
- Every single sub – pixel is formed by a shutter filter combination, and these sub – pixels blend together to form whole picture.

b) List the frequencies of TV channel allocation for band I and III.

Ans:

The carrier frequency should be chosen ten times of highest modulating frequency to get better selectivity at RF and IF tuned amplifier in the receiver. Highest frequency for picture signal is 5MHz. Hence, the carrier frequency is always greater than 40 MHz. TV transmissions is generally in VHF and UHF.

VHF band= 30 to 300 MHz

UHF band=300 to 3000MHz.

Lower band VHF channel (band I): band I has three channels 2, 3 and 4 from 47 to 68 MHz

Higher VHF Channels (band III): band III channels 5 to 12 from 174 to 230 MHz

VHF band –I (47-68 MHz) channel width =7MHz **(2 marks)**

Channel No.	Frequency Band (MHz)
2	47 to 54
3	54 to 61

VHF band- III (174-230 MHz) channel width =7MHz **(2 marks)**

Channel No.	Frequency Band (MHz)
5	174 to 181
6	181 to 188
7	188 to 195
8	195 to 202
9	202 to 209

c) Describe NHK and MUSE system.

Ans:

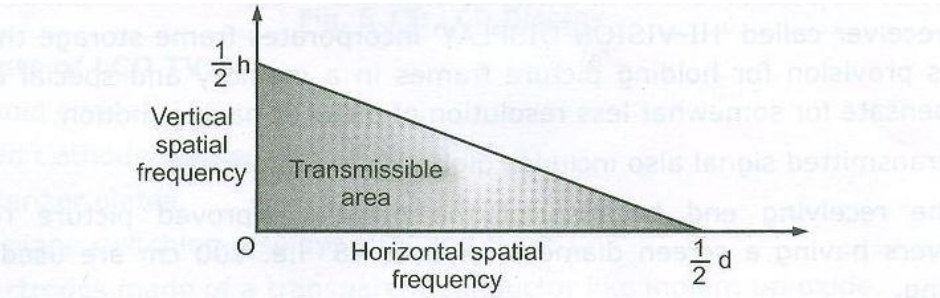
MUSE stands for Multiple Sub-Nyquist Sampling Encoding and is an HDTV bandwidth compression scheme developed by NHK.

It uses fundamental concepts for performance exchange in the spatio – temporal (transitory transformation) domain along with motion compensation to reduce the transmission bandwidth down to near about 10MHz.

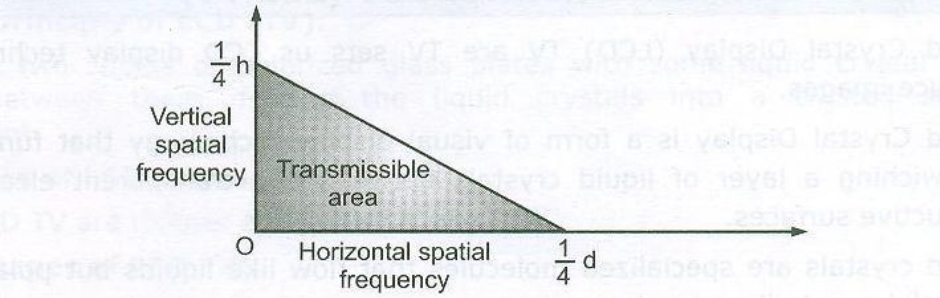
The processed HDTV signal can be then transmitted using a single BDS channel.

Temporal Interpolation (2 marks)

- In MUSE the luminance and colour information are sent by time multiplexed components (TMC)
- The colour information is sent sequentially with a time compression of four.
- The TMC signal is bandwidth reduced means of 3 – dimensional offset sub – sampling pattern over a four – field sequence.
- The stationary areas of the picture are reconstructed by temporal interpolation of samples from four fields.



(a) For Stationary Portion of the Picture (Temporal Interpolation)



(b) For Moving Portion of the Picture (Spatial Interpolation)

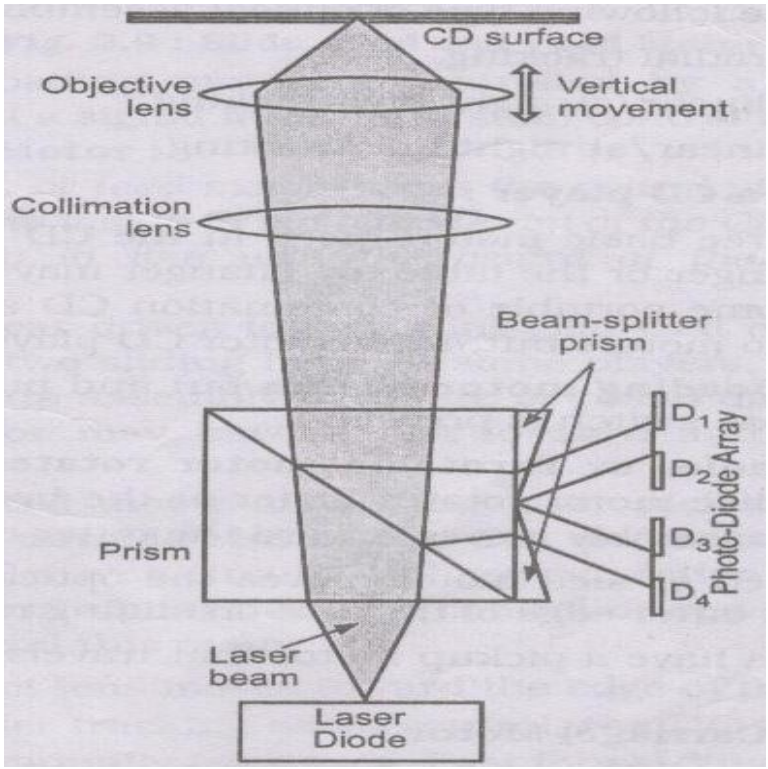
Spatial Interpolation (2 marks)

- For a moving picture area the final picture is reconstructed by spatial interpolation using samples from a single field. Hence moving potions of the picture are reproduced with one-quarter the spatial resolution of the stationary areas.
- The spatial frequency response for both stationary and moving areas of the picture is shown in figure below.
- The lack of resolution during movements of the entire scene as in case of camera panning, zooming or tilting is prevented by introducing spatial motion compression technique.
- A vector representing the motion of the scene is calculated for each filed at the encoder. This signal is multiplexed in the vertical blanking interval and transmitted to the receiver.

- In decoder, the read – out addresses of picture elements (pixels) from previous fields are shifted according to the information provided by the motion vector so that the data can be processed in still – picture mode.
- These two modes of interpolation, the inter – frame processing for stationary pictures and infra field averaging for moving portions of the picture are switched by detecting the moving areas at the decoder.
- Audio transmission is done by 4 – phase DPSK which is multiplexed with the processed video signal in the vertical blanking interval after frequency modulation of the transmission carrier by the video signal.

d) Describe the working of pick-up unit of a CD player with a neat sketch.

Ans: **(diagram – 2 marks, explanation – 2 marks)**



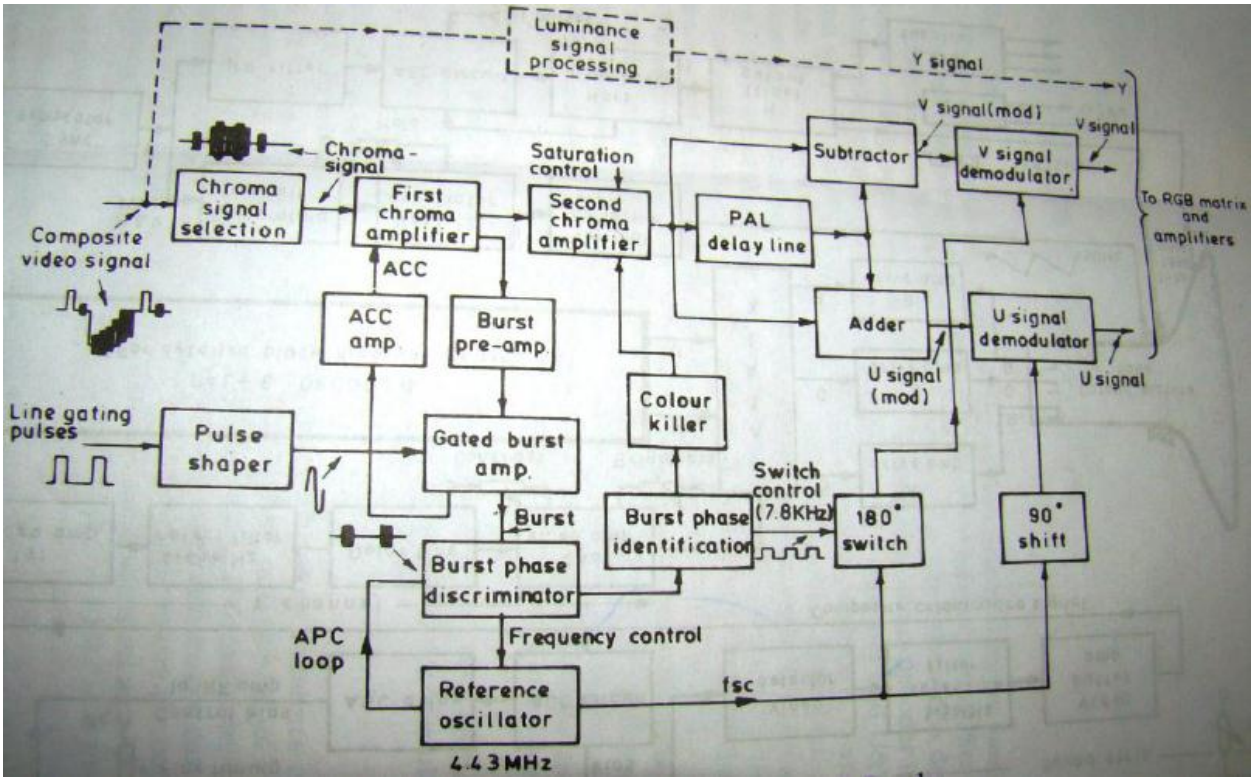
The pick-up assembly consists of-

- A low power laser diode is used to illuminate the CD tracks.
- Lens and prism arrangement to direct the laser beam to the CD surface and to direct the reflected laser beam towards photo-diode array.
- A photo-diode array to obtain data, focus and tracking signal from the reflected laser beam.
- Focus and the tracking coils to focus the laser beam to CD surface and to move the assembly to proper track across the disc surface.
- In the optical pick up unit, the laser diode emits laser beam from a small point into an elliptical or conical distribution. This beam is passed through various prism and lens to form a very small diameter light beam on the disc surface at the center of the track.
- Collimating lens: The main function of the collimating lens is to obtain correct focal length.

- The objective lens is controlled by the tracking and focusing coil to keep the beam focused on the CD and to keep the condensed beam at the center of the track.
- This laser beam is reflected back by the flat area and the pits on the disc surface. This reflected beam is applied to a group of photo –diodes through objectives lens, collimator lens, and some prism arrangement.
- These photo-diodes induce voltage according to the reflected beam falling on it. Focus error and tracking error voltage generated by this photo-diode array is applied to the tracking and focusing coil to control the objective lens and data signal generated by this photo-diode array is send to amplifier to amplify the data signals picked up from the disc. Finally, the output from the amplifier is processed to produce the audio signal stored on the disc surface.

e) Draw the block diagram of PAL-D decoder.

Ans: **(any correct relevant diagram – 4 marks)**



f) State the requirement of stereo amplifier to become Hi-Fi amplifier. (any four)

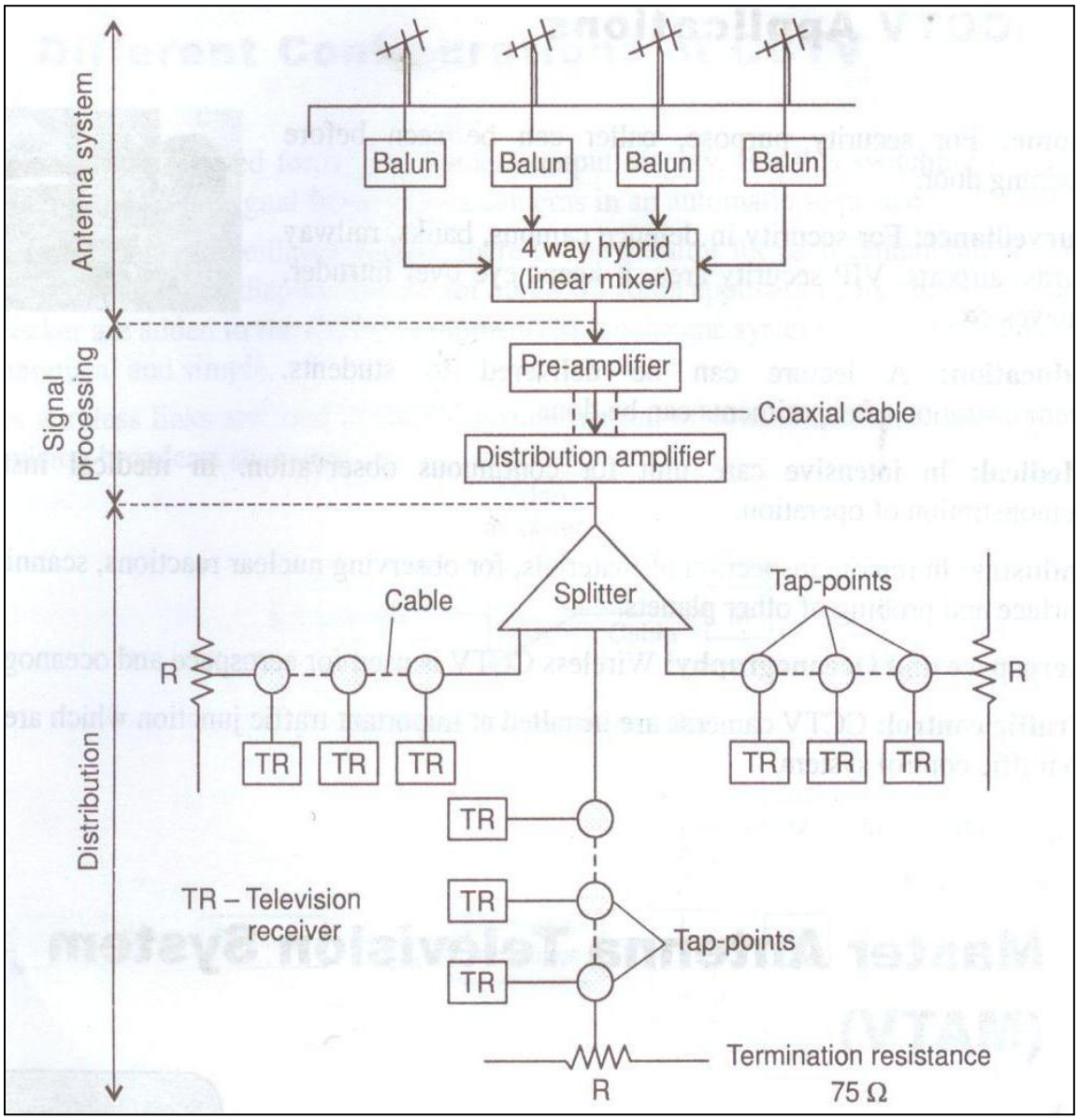
Ans: **(Any four correct requirements – 1 mark each)**

1. Signal to noise ratio should be better than 50dB,
2. Frequency response should be flat.
3. Non-linear distortion should not be more than 1%.
4. The system should possess dynamic range atleast 8dB.
5. Stereophonic effect should be provided.
6. Environmental conditions should be such as to eliminate the external noise in listening room.

Q3) Attempt any four: 16 marks

a) Draw the layout diagram for distribution of cable connection for MATV and describe it.

ANS: (Diagram: 2 mks, Explanation: 2mks)



Master antenna TV system is used to deliver a strong signal (over 1mv). It is delivered from one or more antennas to every television receiver connected to the system. This type of system is implemented in the areas where signal strength is less. It is generally used in large hotels, motels schools and apartment building.

Master or common antenna: One or more antennas are usually located one roof top. The number of antennas is dependent on available telecast and their direction. Each antenna is directive and properly oriented.

Balun: MATV system is having impedance of 75 Ω. Most of the antennas are having impedance of 300 Ω. Balun is used to match balance antenna with an unbalanced coaxial cable. It is a matching transformer.

Hybrid: Antenna outputs feed in to a 4 way hybrid. A hybrid is a signal combining signal linear mixer. It provides suitable impedance matches to prevent standing waves produced. The standing waves results in ghost images.

Amplifiers: There are two types of amplifiers. One is preamplifier which is low noise amplifier to keep SNR high at the antenna. The other is a high gain amplifier called as distribution amplifier. It is used to boost the signal to compensate the loss which would occur in the distribution cables. It provides acceptable signal to every receiver in the system.

Coupler or splitter: Coupler or splitter is a coupling device which splits the signal to feed to the main branch lines. The output from distribution amplifier is fed to splitters trough coaxial trunk lines. A splitter is a resistive- inductive device. It provides trunk line isolation and impedance matching.

Subscriber taps: Each branch line serves several homes. Coaxial distribution branch lines carry television signal. The output of splitter is delivered to subscriber through tap-offs. The subscriber taps can be transformer coupled capacitive coupled or resistive pads. The tap provides isolation from other receiver on the same trance. This prevents mutual interference. The taps look like ac outlets. They are mounted normally in the wall. Wall taps may be obtained with 300 Ω output or 75 Ω tap with a matching transformer is preferred. The matching transformer is mounted at the antenna terminal of the receiver. It will have a VHF output and UHF output.

TV receivers: The modulated ratio frequency carrier is fed to each individual TV receiver. It is fed from respective tapping on the branch line. The feeder is off twin feeder type or coaxial cable. Its impedance is matched with impedance of TV receiver.

Terminal resistance: The improperly terminated lines develops standing waves, each branch line should be properly terminated. For this, the end of each 75 Ω distribution cable is terminated with 75 Ω resistor is called terminator.

b) Differentiate NTSC with PAL with respect to types of chrominance modulation, line frequency, field frequency and used in which countries.

ANS: (each parameter: 1 mks)

Sr. No.	Parameters	NTSC	PAL
1	Chrominance modulation	I and Q signal I=0.60R-0.28G-0.32B Q=0.21R-0.52G+0.31B	U and V signal U=0.493(B-Y) V=0.877(R-Y)
2	Line frequency	15.734 KHZ	15.625 KHZ
3	Field frequency	60HZ	50HZ
4	Used in which countries	American countries and and many Asian countries like Japan	In Uropian countries as well as in India

c) Draw and describe the block diagram of Hi-Fi amplifier.

ANS: (Diagram: 2 mks, Explanation: 2mks)

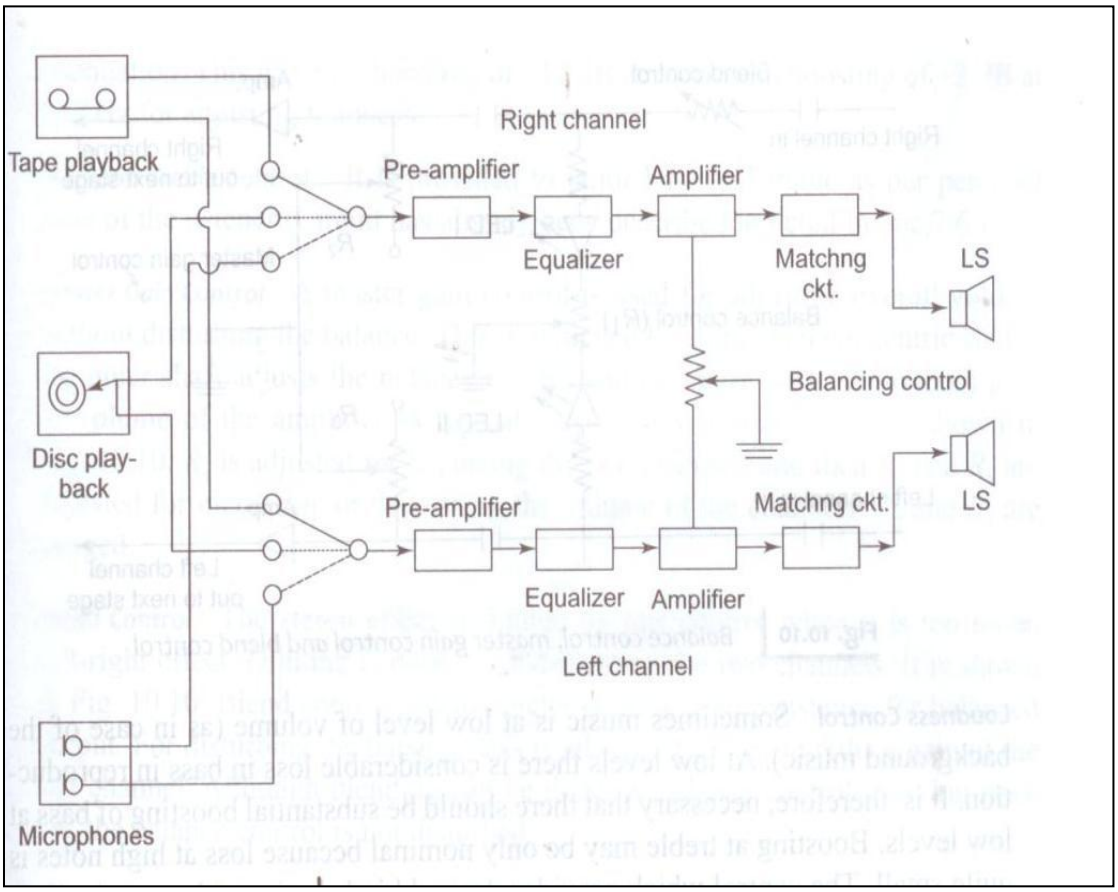


Figure shows the block diagram of a high-fidelity stereo reproducing system.

High- fidelity sound can be obtained from the recorded stereo tape or in live system from the microphones. (Stereo signal can also be obtained from the record player.)

The stereo signal is fed to two independent amplification channels through a tape-mic switch. The amplifier system consist of a low noise high gain preamplifier, equalizer, well design amplifiers giving flat frequency response and little distortion by using negative feedback circuit and then the matching transformer.(A balancing circuit is incorporated to balance out any imbalance in the characteristics of otherwise identical circuits.) The secondary of the matching transformer of each channel is connected to the respective loudspeaker column. For Hi-fi, the loudspeaker columns consisting of woofer, squawker and tweeter are used.

All the blocks are design so as to get fat frequency response (from 40 to 15000Hz), little distortion (less than 1%), high signal-to-noise ratio (more than 50db) and high dynamic range (100 db) to achieve the final output of high fidelity.

Balance control: Two amplifiers of a stereo system, although independent of each other are built as matched pair to give equal output for the same input. In spite of the two amplifiers being identical, there may be variations in the characteristics of transistors and ICs and positioning of loudspeakers and furnishings with respect to the listener. The circuit used to compensate for such variations are called Balance control.

Loudness control: Sometime music is at low level of volume (as in case of the background music). At low levels there is considerable loss in bass in reproduction. It is therefore, necessary that there should be substantial boosting of the bass at low levels. Boosting at treble may be only nominal because loss at high notes is quite small. The control which provides desired big boosting at bass and a little boosting at treble is called loudness control.

Bass and Treble control: It is provided to tailor bass treble as per personal taste of the listener.

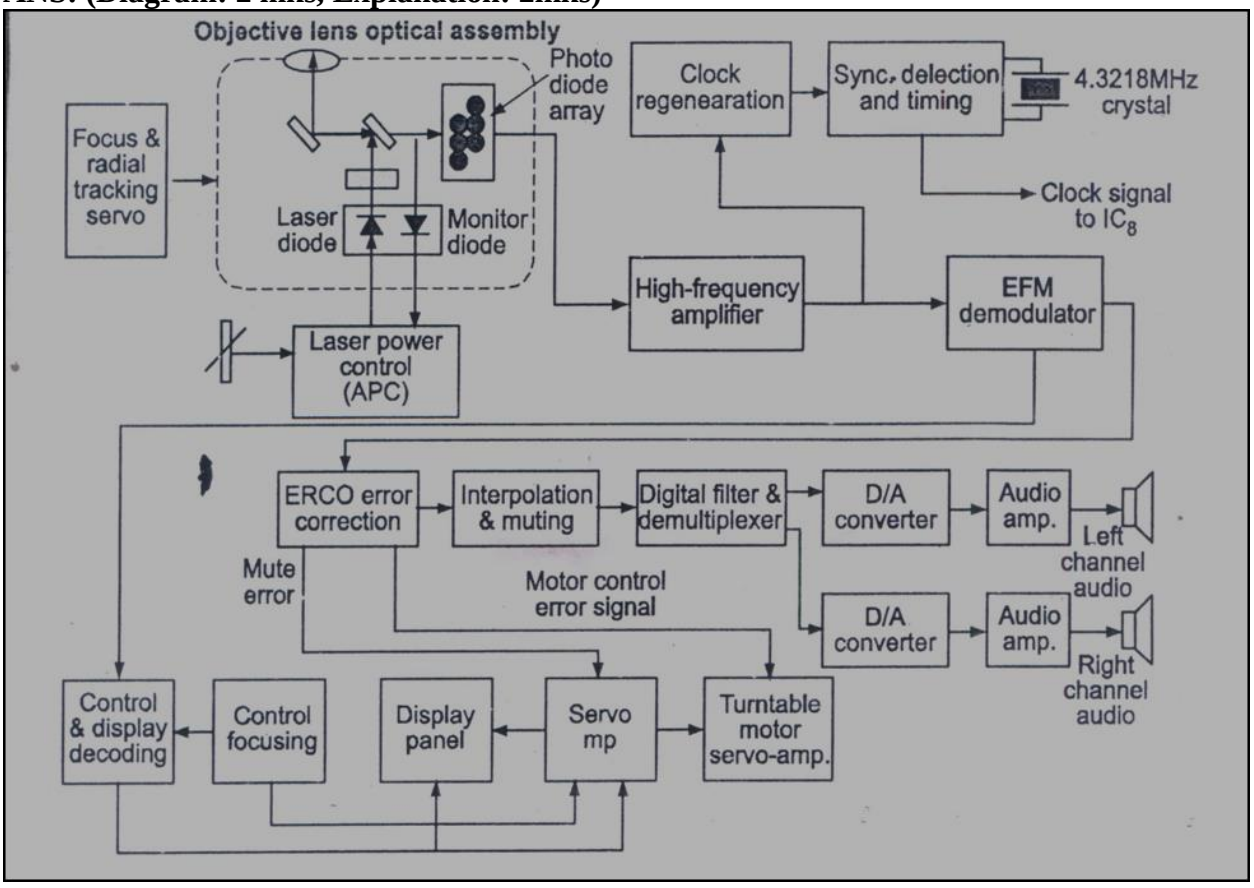
Master Gain control: a master gain control is used for adjusting overall volume without disturbing the balance. This is achieved by using dual concentric shafts, the inner shaft adjust the balance control and the outer shaft, the overall gain or volume of the amplifier. A typical master gain control circuit is shown in figure is adjusted for balancing the two channels and then R2 and R3 are adjusted for increasing or decreasing the volume of the channels. R2 and R3 are ganged.

Blend control: The stereo effect is diluted by this control when it is too much left- right effect. Diluting is done by disbalancing the two channels. It is shown in figure. Blend control potentiometer is set at zero resistance for balance output. For disturbing the balance, this is advanced further to reduce gain of the left channel. Although blending can be done by balance control also, but once set, the balanced control is not disturbed.

Quasi stereo switch: When any one channel signal is made to go into both the channels, one can use both channels and their speakers for a monophonic source of signal. This is done by a switch called quasi-stereo switch.

d) Describe the block diagram of CD player with neat block diagram.

ANS: (Diagram: 2 mks, Explanation: 2mks)



CLV: The CD player is also known as CLV or constant linear velocity system. In a CLV device such as the CD player the rotational speed of disc player is adjusted with movement of reading mechanism on the disc surface. This speed is changed to maintain constant linear velocity i.e. the signal on the disc surface always moves at constant speed of 1.3 m per second under the pick-up head.

Half-Full Memory: This half –full memory circuit makes the disc to maintain a constant linear velocity when the reading mechanism moves from outer tracks of disc to inner tracks or from inner tracks to outer tracks on disc surface.

Decoding CD: During the decoding, the digital data on the disc surface is read by the decoding circuit and is converted Into the analog and 0 signal required to drive the speakers and regenerate the stored music.

Optical pick-up: the signal stored on the CD surface as pits and flat areas are first picked up by the optical pickup made of lens assembly prism, photo detectors and laser diodes assembly in the optical pick-up unit.

High frequency amplifier: The signal is very weak so it is amplified by a high frequency RF amplifier circuit to bring signal to a proper level. This amplified and filtered high-frequency signal contains audio signal as well as synchronization signal in 14-bit EFM (eight to fourteen modulated) format, this signal is sent to an EFM demodulator circuit.

EFM Demodulator: The EFM modulator separates the modulated data and the timing signal from the signal received at its input. It also removes the additional coupling bits and convert the 14-bit EFM symbol to actual 8-bit data. The amplified and filtered EFM signal from high frequency amplifier is also given to clock generation circuit to synchronize detecting and timing circuit. These circuits are used to recover the bit clock and sync pattern data .The timing separated by this system is used to provide timing signal to the system.

ERCO Circuit: demodulated data from EFM demodulator is send to error correction (ERCO) circuit. The demodulated data signals also send to control and display decoding circuit, which recovers the control and display signal received from CD.

Interpolation and muting: The ERCO circuit is used for error detection and correction purpose. Any error found in the incoming data signal is send to interpolation and muting section by the

ERCO circuit. The interpolation and muting section uses the following methods to correct error found in data stream read from the disc.

- Muting
- Last word held
- Linear Interpolation

Muting: In muting, when error is detected in the data stream , the player will mute (silence)the sound is not to send speaker .

CLV using the Clock Signal: The ERCO also responsible for maintaining constant linear velocity of CD rotation motor , For this , The TRCO circuit compare the clock signal derived from the incoming data with reference clock frequency.

De- interleaving: Signals from the ERCO contains audio signal in the interleaved format. before doing any further operation on this signal, it must be interleaved. The signal Is then de-interleaved in the interpolation and muting section to restore the original sequence of information.

Digital Filter and De-multiplexer: The de-interleaved and regenerated is then send to digital filter and de-multiplexer , where it is filtered and separated in to left and right channel data. This circuit removes any effect of sampling frequency from the data signal , which would appear as interference in the form of aliasing noise in analog signal.

Oversampling: During digital filtering oversampling method is used to remove both problems of aliasing noise and quantization error.

D/A convertor: The output from digital filter and de-multiplexer circuit is send to D/A convertors. The right and left channels are processed by different D/A convertors. These convertors convert the 16-bit digital signal into the original analog audio signal. Because of the over sampling, done in the digital filter and de-multiplexer circuit simple low-pass filter is used following the D/A process.

e) Define vestigial side band transmission. State its any two merits and demerits.

ANS: (Define: 2 mks, merit: 1 mks, Demerit: 1 mks)

The picture signal is amplitude modulated and sound signal is frequency modulated before transmission. In 625 line system, the video signal frequency components are from 0 Hz to 5MHz. In Double side band A.M. transmission is used, bandwidth required will be 10MHz. Actual bandwidth is more than this due to practical filter characteristics. Practically it is not possible to determine the bandwidth abruptly so guard band of 0.5 MHz on each side should be given. In addition to this, 0.25 MHz is given for sound transmission on upper side.

This together with forms channel bandwidth as 11.25 MHz using doubled side band system.

To reduce bandwidth and power transmitted vestigial side band system is used. In this full upper side band transmitted and vestige or part of lower side band transmitted which results in to reduced bandwidth to 7 MHz.

Merits: (any two)

i. Bandwidth is reduced so that more number of channels can be accommodated in a given frequency spectrum.
ii. Power saving of 50% possible at transmitted power is moderate.
iii. Filter design becomes practicable so circuits used are not costly complex.
iv. No distortion occurs and no loss of low frequency component results in less interference.

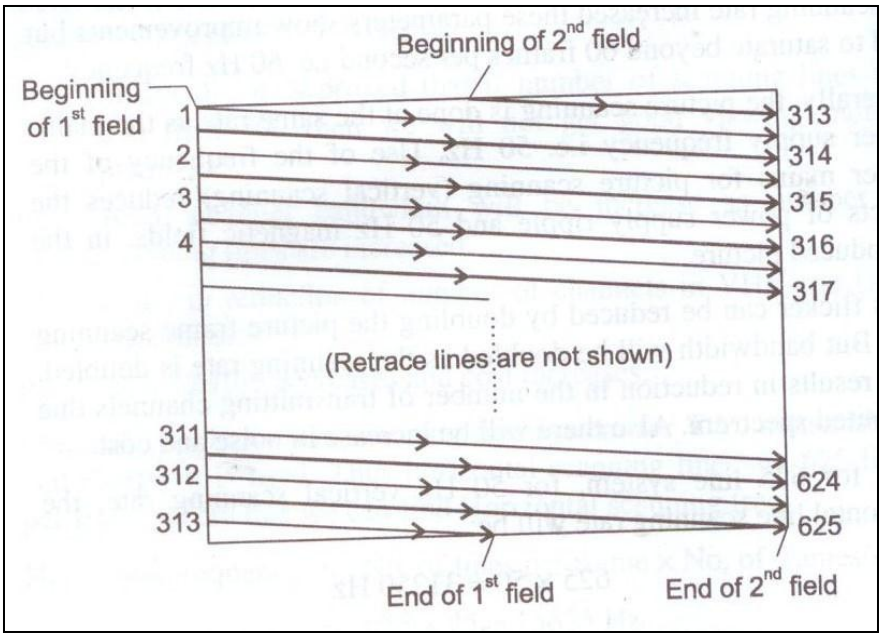
Demerits: (any two)

I. A small portion of transmitter power is wasted in the vestigial side band filters which remove the lower sideband.
II. Signal to noise ratio is slightly less than what it would be in total D.S.B. because in the vestigial sideband signal, the lower side band frequencies from of 0 to 0.75 are present in both sidebands while the rest of the frequencies from 0.75 to 5MHZ are present only in one sideband.
III. The low video frequencies contain the most important information of picture is if the lower sideband is completely suppressed then there is distortion which is manifested as ‘smear’ in the picture.

Q4 A) Attempt any three: 12 marks

a) Describe the neat sketch how interlaced scanning will help to reduce the bandwidth of the video signal.

ANS: (Diagram: 2 mks, Explanation: 2 mks)



To reduce flicker, an effective rate of 50 vertical scans per second is utilize in television pictures system. This is accomplished by increasing the downward rate of travel of the scanning electron beam. By increasing downward scanning rate, every alternate line gets scan instead for every successive line. After the 1st scan the beam reach the bottom of picture frame, the beam quickly returns to the top to scan remaining lines which are missed in 1st scan.

Thus the total number of lines in picture frame are divided into are two groups called as fields. Each field is scan is scan alternately. This is called as interlaced scanning. This is like reading alternate lines of a page. It reduces flicker, which results in reduction of bandwidth and noise.

Figure shows principle of interlaced scanning. In this vertical retrace time is considered zero and horizontal retrace lines are not shown for convenience. This figure shows 625 lines T.V. system a frame of 625 lines is divided into two fields having 312.5 lines each. Each field is scanned alternately to cover the entire picture.

In first field, 312.5 odd lines are scanned only, which is called as odd field. The scanning sequence is 1, 3, 5, 7 …

After this the beam spot returns to the top of the screen and remaining half part of the 313th lines and all even number of lines are scanned. This is called as even field. The scanning sequence is 2, 4, 6…

To achieve this, the vertical sweep oscillator (saw tooth waveform) made to operate at 50Hz frequency so that to successive interlaced scans make up the complete picture frame.

This method reduces flicker. But at high brightness levels interline flicker observed. Also bandwidth and noise reduced. Sometimes interlacing error occurs, if the lines of even fields are not exactly in the middle of the odd field. This will cause paring of lines which results in jagged

picture giving silky effect or fishtail. Interlacing error results due to error in starting of first line of the even field. Even field does not starts exactly at the middle of the picture fame.
Because of this uneven spacing between the lines of two fields occurs. It is caused due to an open capacitor in the integrating circuit or by an open decoupling capacitor in the vertical oscillator.

b) List any two merits and demerits of negative modulation.

ANS: (any two merit: 2 mks, Demerits: 2mks)

Merits:

i. Effect of noise interference on synchronization.
ii. Peak power available from the transmitter.
iii. Reference level for AGC(Automatic gain control)circuit.
iv. Power saving in transmitter.

Demerits:

i. Effect of noise interference on synchronization.
ii. Picture tube needs positive polarity between control grid and cathode.
iii. Horizontal stabilizing circuits are a must a noise pulse going in the blanking level causes synchronization trouble (because synchronization pulses are also in the blacker than black region).
iv. AGC reference level in higher than positive modulation because in negative modulation blanking level is 75 % and synch pulses level at 100% are used in AGC reference level.

c) State the function of tray motor and slide (feed) motor.

ANS: (Function of each: 2 mks)

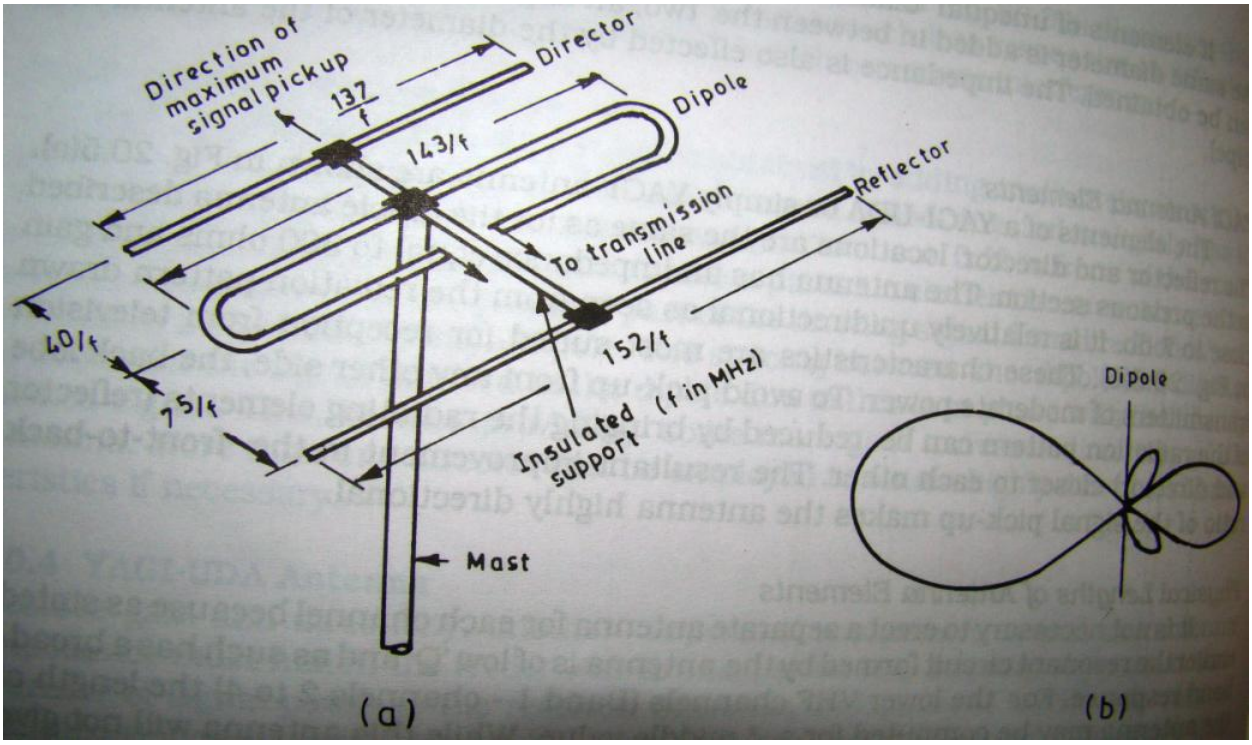
Tray (carriage) motor: When the open/close switch is pressed, the carriage motor moves the CD tray in and out for loading and unloading the CD. Thus the function of this motor is to 'push out' or inject as well as to push in the CD tray.

Feed motor: This motor moves the optical pick up unit from the centre to the outer edge of the disc on sliding rods. Some players have pick up motors that travels in a radial or semicircle fashion. This motor keeps an objective lens constantly in line with the centre of the optical axis or track.

The feed motor may have a fast forward and fast reverse mode operation. The fast forwarding and fast rewinding of the slide motor can be used by switching for smoother accessing. When program search is there, the motor is rotated at high speed. In such high speed access, the servo signal is cut off and a large drive voltage is applied to the feed motor, so that the pick-up assembly is moved at a high speed. All this functions are controlled by PLL and servo processor according to user selection.

d) Draw the Yagi-Uda antenna and its radiation pattern. Explain its working.

ANS: (Diagram: 2 mks, Explanation: 2 mks)



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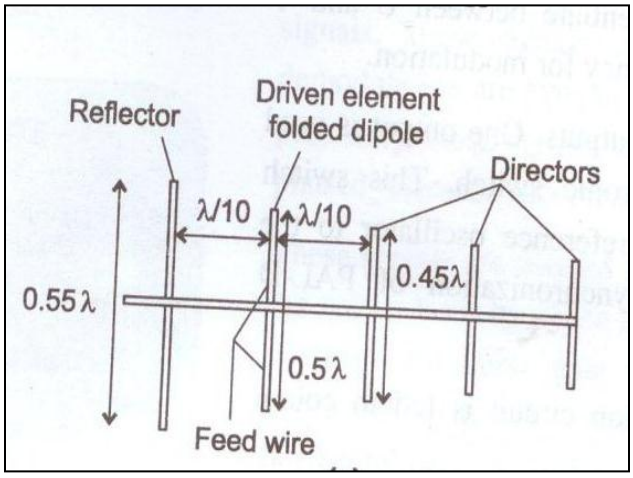
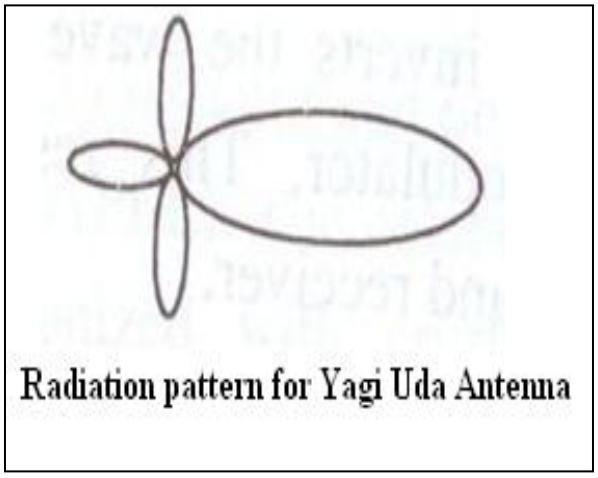




It consist of driven element i.e. dipole antenna, reflector and director. They are arranged collinearly and close together.

Such antennas are widely used for TV signal reception at receiver for locations within 40 to 60 KM from transmitter.

The reflector is placed the back of the folded dipole, reflector reflect unwanted signal. The director is placed in front of folded dipole which collect wanted signal.

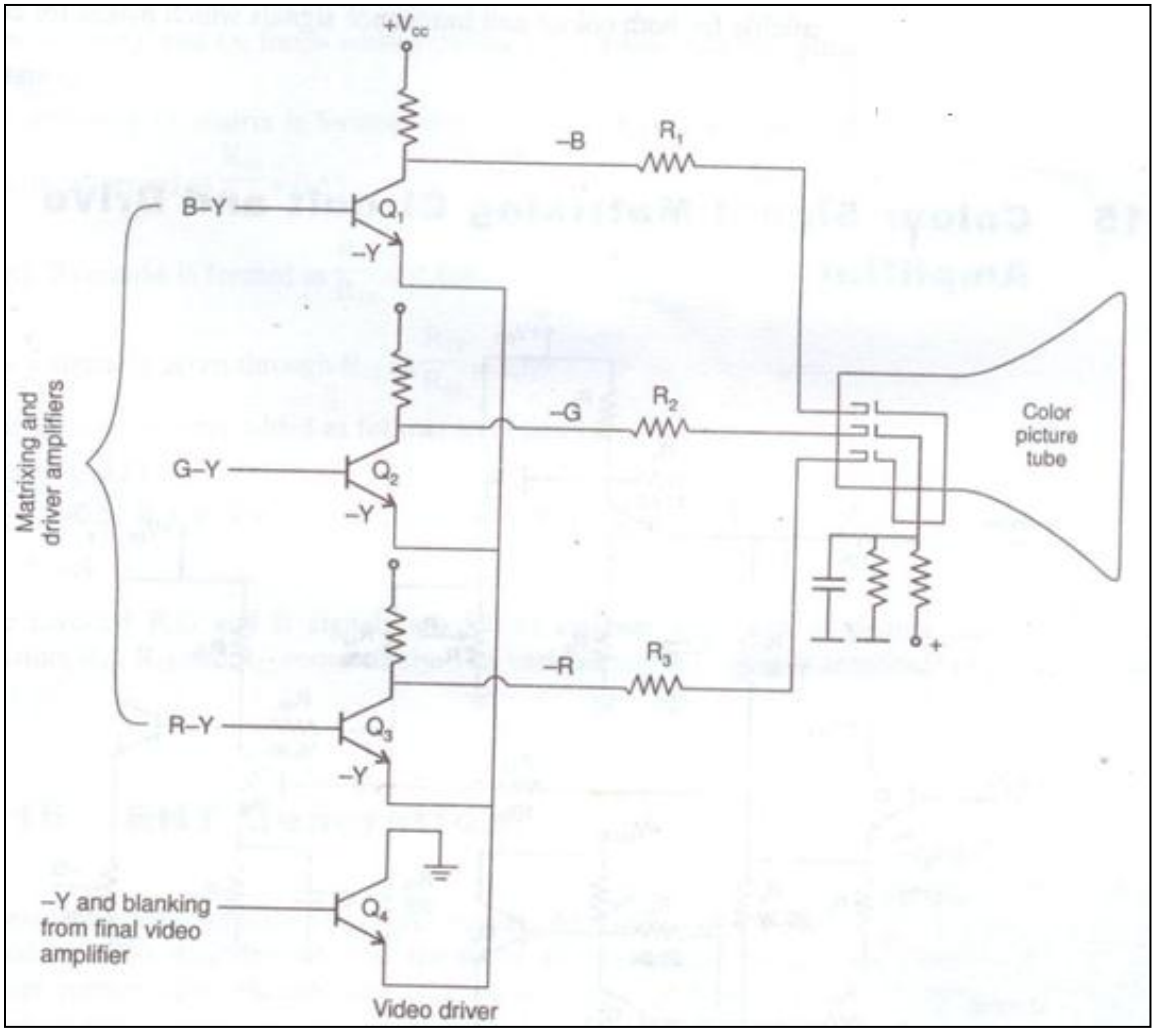
The directors are always more than one and always face the transmitting antenna. The folded dipole with one or two directors and reflector gives high gain. It also provides high beam width per unit area of array, so some times they are called as 'Super gain antenna'. The reflector and directors are collectively called as parasitic elements.

The separation between the reflector, folded dipole and directors is minimum 0.1 λ. If this distance is reduced than 0.1 λ, then the input impedance of the array get decreased. The radiation pattern can be improved by increasing front to back ratio. This can be obtained by bringing radiators closer i.e. array element closer. The signal feed point is at folded dipole. The parasitic element are not connected anywhere electrically.

Q4 B) Attempt any one: 6 marks

a) Draw the circuit diagram of RGB drive amplifier used in colour TV. Explain the function of each components used in it.

ANS: (Diagram: 4 mks, Explanation: 2 mks)

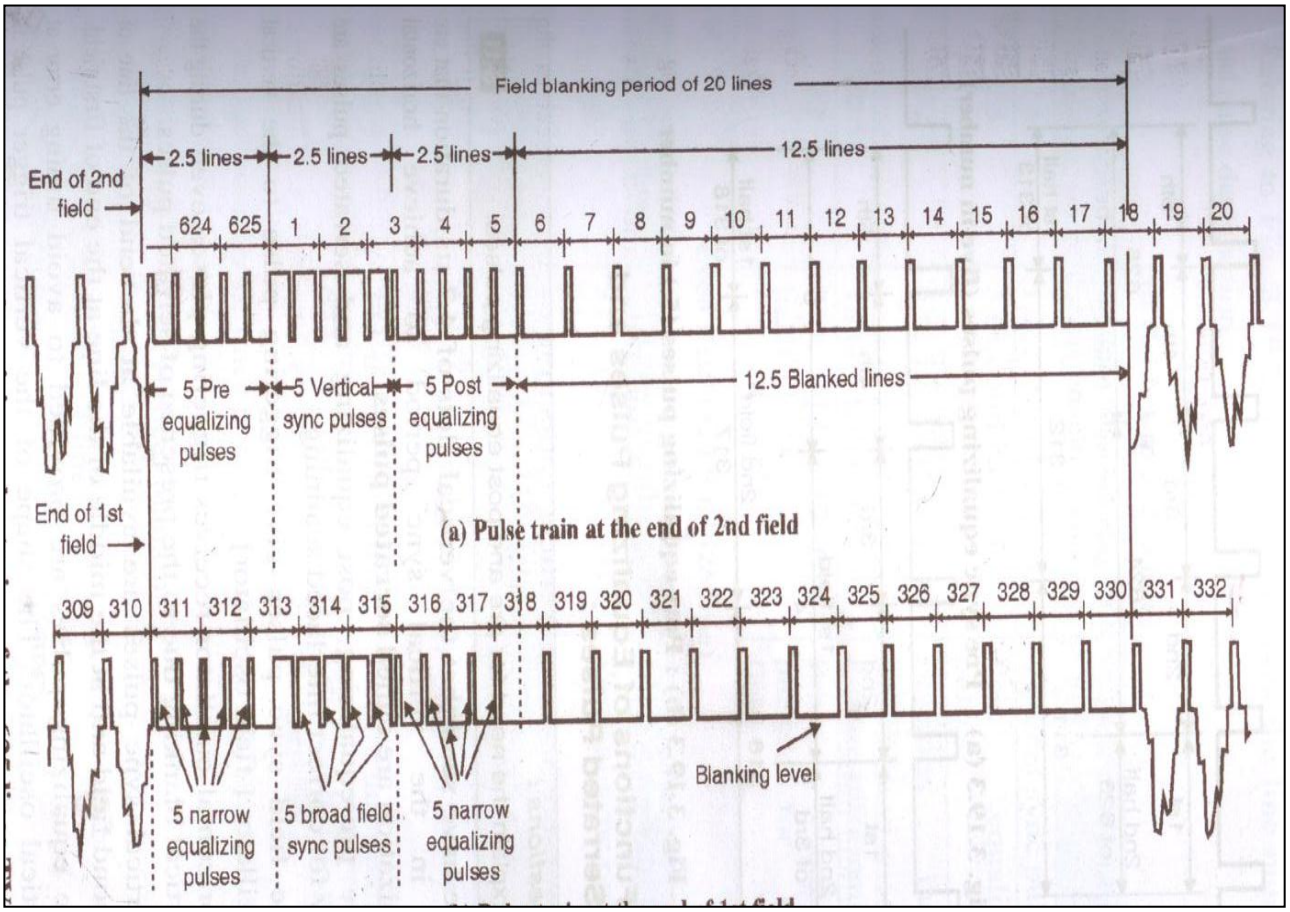


In RGB matrix, Q_1, Q_2, and Q_3 transistors are in CE configuration.Q_4 transistor is in CC configuration. Thus it acts as buffer. Output of this buffer is given to collectors of Q1, Q_2, and Q_3 CE amplifiers. Input to these amplifiers at base terminals are B-Y, G-Y and R-Y respectively. The outputs of these matrixing driver amplifiers are -B, -G and –R respectively. In this matrixing network colour difference signals are combined with y in driver amplifiers. The obtained R, G and B colour signals are negative going to drive cathodes of picture tubes. Latest chroma IC has all functions including matrixing and amplification.

b) Describe why equalizing pulses are required. Draw the vertical synchronizing pulse structure.

ANS: (Diagram: 4 mks, Explanation: 2 mks)

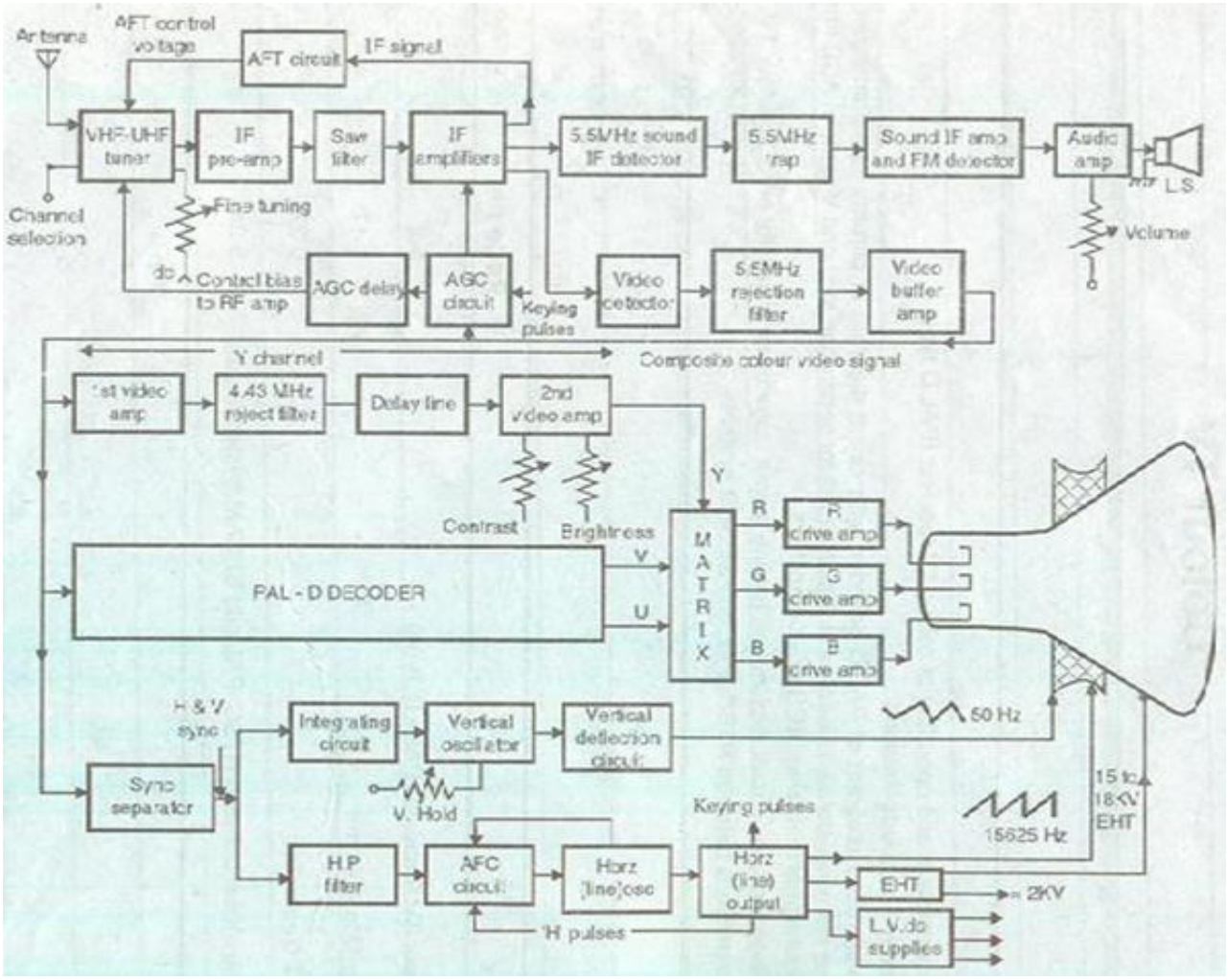
- This is a ½ line difference just prior to the start of serrated vertical pulse.
- This ½ line difference does not affect the horizontal deflection synchronization but it does affect the vertical synchronization and the interlaced scanning. The effect of uneven line period can be reduced by increasing the interval between the preceding line pulse and the field sync pulses.
- To ensure that the vertical deflection oscillator receives the necessary triggering voltage at the same time after every field, a series of five narrow pulses 2.3 μs each, occurring at half line rhythm, are inserted before the field sync pulse.
- These are called pre equalizing pulses. The width of equalizing pulse is normally half the width of horizontal sync pulses, roughly half of 4.7 μs or (2.3 μs).
- The equalizing pulses inserted after the vertical synchronizing pulses are post equalizing pulses. these equalizing pulses do not disturb the operation of either oscillator, yet they permit the vertical sync pulse to occur at the correct time after every field.



Q5. Attempt any two: (16 marks)

a) Draw the block diagram of colour TV receiver. How signal is processed in each block.

Ans: **(Diagram 4 marks, explanation 4 marks)**

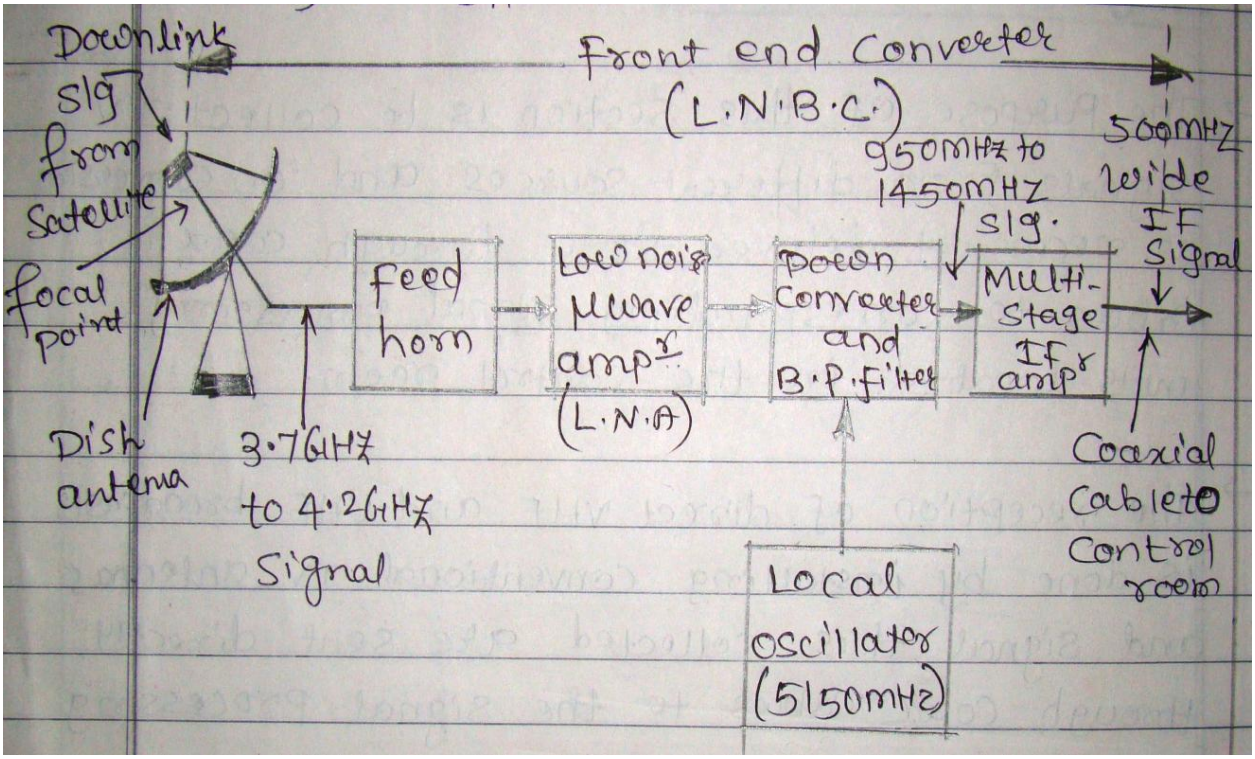


- A colour TV receiver contains all the necessary circuits of a monochrome receiver plus additional circuits required for the reproduction of a coloured picture.
- Basically a colour TV receiver is a black-and-white receiver with a decoder for the colour signals and a colour picture tube.
- The figure is the functional block diagram of a colour TV receiver.
- The block diagram shows that the circuits like the RF tuner, VIF amplifier, the video amplifier, the deflection sync, the sweep circuits and the EHT sections are virtually the same as in black-and-white receiver.
- However there are some minor differences in design and details. For example the RF response in case of colour TV is kept more uniform than in monochrome receiver, this is to avoid any attenuation of the colour sub-carrier.
- The tuning of a colour TV is critical. To avoid any mistuning of the receiver, an arrangement called AFT (Automatic Fine Tuning) is used in most cases. This arrangement is similar to the AFC and can be switched off whenever manual tuning is required.

- The colour TV uses the inter carrier sound system with one difference. The sound take-off point is at the last VIF stage immediately before the video detector. This is done to avoid interference between the sound IF and the chroma signal.
- A separate diode detector is used to produce the sound IF but the rest of the audio circuits are the same as in a monochrome receiver.
- The two main circuits which distinguish a colour TV from a monochrome TV are the colour picture tube and the chroma section containing the colour circuits.

b) Draw and describe the block diagram of LNBC. List it's any two applications

Ans: **(Explanation 3 Marks, diagram 3 marks and applications 2 marks)**



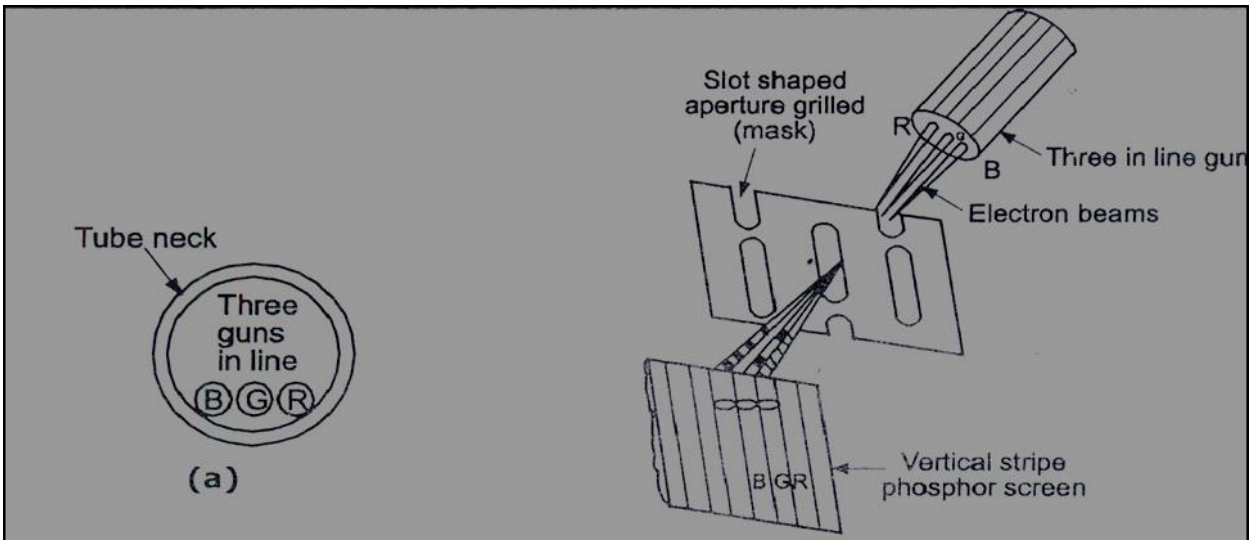
- **Dish antenna and feed horn:** A feed horn is actually a flared open waveguide section which is mounted at focal point and its function is to receive signals reflected towards it by the delivers these to the close by located unit called as Low Noise Block Convertor (LNBC).
- **Low Noise Amplifier (LNA):** The CVS collected by the feed horn is fed to LNA which is specially designed to provide enough gain which maintains maximum possible S/N ratio.
- **Mixer (down convertors):** Mixer translates the incoming microwave signals to a lower frequency range of 950-1450MHz. This is achieved by mixing local oscillator frequency of 5150 MHz at mixer and selecting only the difference from output.
- **Band pass filter:** A BPF at the output mixer separates the wanted IF signals from the other signals.
- **Multistage IF amplifier:** It amplifies the down converted signals and then sent through high grade coaxial cable to the CATV.

Applications of LNBC :-(Any two)

1. It is the device on the front of a satellite dish that receives the very low level microwave signal from the satellite, amplifies it, changes the signals to a lower frequency band and sends them down the cable to the indoor receiver.
2. This down conversion allows the signal to be carried to the indoor satellite TV receiver using relatively cheap coaxial cable; if the signal remained at its original microwave frequency it would require an expensive and impractical waveguide line

c) Describe the PIL and delta gun picture tube with neat sketch.

Ans: **(PIL diagram and explanation -2 marks each, Delta gun diagram and explanation -2 marks each)**



Precision in line picture tube -construction

The overall colour seen is determined both by the intensity of each beam and the phosphors which are being bombarded.

If only one beam is 'ON' and the remaining two are cut-off, dots of only one colour phosphor get excited.

Example, when no transmission then our TV screen shows only blue raster.

Similarly, if one beam is cut-off and the remaining two are kept ON, the rasters produced by excitation of the phosphors of the two colours will combine to create the impression of a complementary colour.

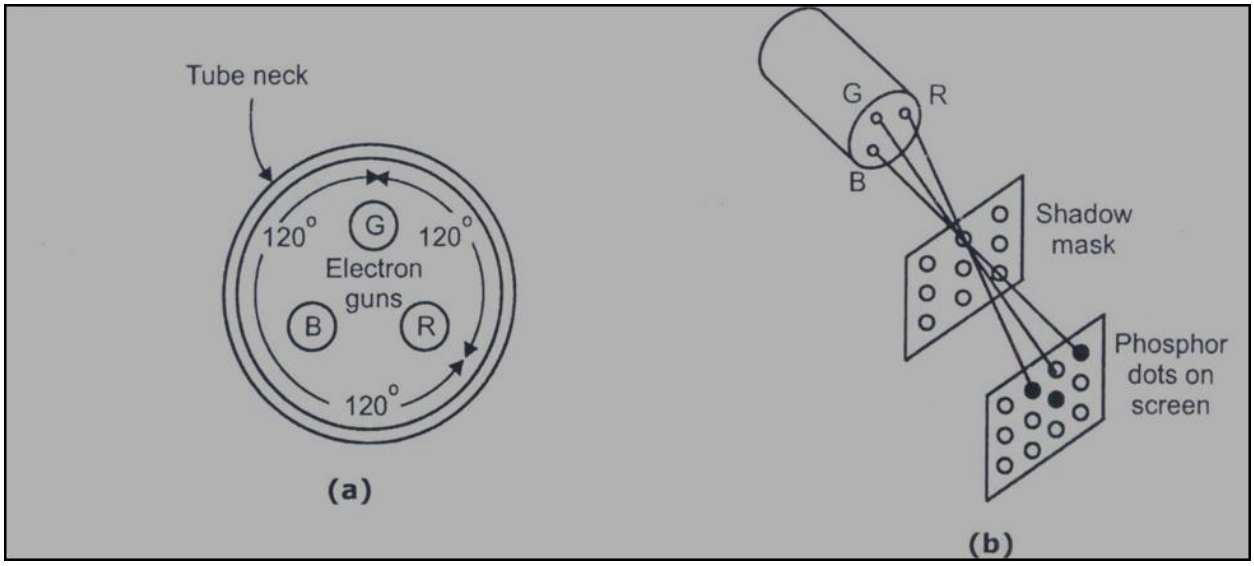
When all the three guns are active simultaneously, lighter shades are produced on the screen.

This is because red, green and blue combine that forms white and this combines with whatever colours are present to de-saturate them.

Naturally, intensity of the colour produced depends on the intensity of beam currents.

Back in a picture is just the absence of excitation when all three colour differences signal to zero, the only signal left to control the three guns would be Y signal and thus a black and white picture will be produced.

Delta gun picture tube- construction



- Electron beams from the guns strike three phosphor dots of traid. The dots of red , green and blue phosphor in traid glow simultaneously , the intensity of glow being proportional to the intensity of video signal of respective colour . the eye adds the three colour emitted by the phosphor dots at time and perceives the resultant colour of the concerned pixel as the original picture.
- The traids glow one after other in quick succession due to deflection of the beams and hence whole picture is reproduced in its original colour .
- It employs three separate guns shown in fig , one for each phosphor
- The guns are equally spaced at 1200 interval with respect to each other and tilted inwards in relation to the axis of tube .Thus , they form an equilateral triangular configuration forming the capital greek letter delta(Δ) so the name.As shown in the fig , the tube employs a screen where three color phosphor dots are arranged in groups known as traids.
- Each phosphor dot corresponds to one of the three primary colours.
- The traids are repeated and and depends on the size of picture tube , are deposited on the glass face plate (3,33,000 traids)
- A thin perforated metal sheet known as shadow mark is located 1 cm behind the tube screen.
- The mask has one hole for every phosphor dot traid on the screen.
- The various hole are so oriented that electrons of three beams on passing through any one hole will hit only the corresponding color phosphor dots on the screen.
- The ratio of the electrons passing through the holes to those reaching shadow mark is only 20%
- The remaining 80% of the total beam current , energy is dissipated as heat loss in shadow mask.

Q6. Attempt any four: **(16 marks)**

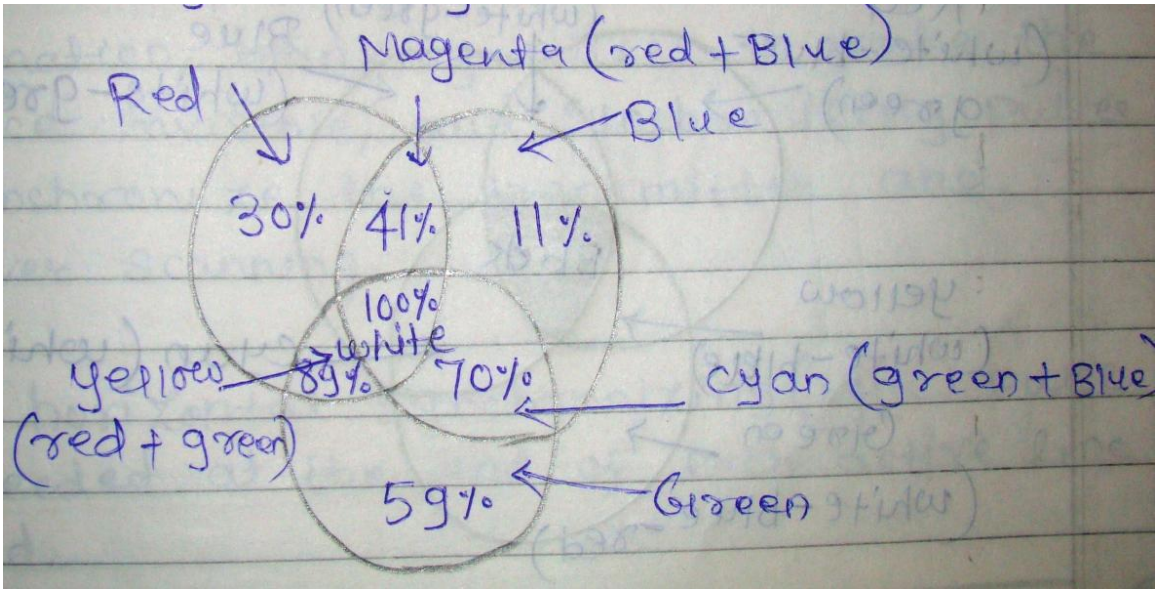
a) State Grass man's law. Draw the sketch of additive mixing.

Ans: **(Statement 2 marks, diagram 2 marks)**

Statement:- "Eye perceives new colour depending on the algebraic sum of red , green & blue light fluxes. This forms the basis of colour signal generation & is known as grassman's law."

The eye is not able to distinguish each of the colour that are mixed to form colour but instead perceives only resultant colour.

For example yellow can be produced by mixing 30% of red & 59% of green.



Red (30%) + Green (59%) =Yellow (89%)

Red (30%) + Blue (11%) = Magenta (41%) (purplish blue)

Blue (11%) + Green (59%) = Cyan (70%) (greenish blue)

Red (30%) + Green (59%) + Blue (11%) = White (100%) (luminance)

b) Why AM is preferred for picture signal and FM is preferred for sound signal in TV system.

Ans: (Four reasons- 4 marks)

AM is preferred for picture because the following reasons,

- Because of video's complex nature, AM lends itself to transmitting several different signals simultaneously, like video, chroma, sync, etc. and it can provide the bandwidth required to do it easily.

FM is preferred for sound because the following reasons,

- FM for the audio has a bandwidth of 100 kHz, and FM is much better for that. It's also a `cleaner signal'. The big advantage of FM is its audio quality and immunity to noise
- For sound (i.e. Audio transmission), frequency modulation is used. There are various reasons for preferring FM for sound transmission over AM.
- Both AM and FM are capable of giving the same fidelity. If the desired bandwidth is allotted. Because of crowding in the medium & short wave bonds in radio.

- The highest modulating audio frequency used is 5 KHz and not the full audio range which extends about 15 KHz.
- Thus the limit of the highest modulating frequency result in channel band width saving & only a band width of 10 KHz is needed per channel. Thus it becomes possible to accommodate a large number of radio broadcast station in the limited broadcast band.

c) Describe the need of multiplexer and attenuator in cable TV.

Ans: **(need of multiplexer and attenuator- 2 marks each)**

Need of multiplexer:

- In cable distribution center many channel signals are separated, modulated and frequency is allotted to each channel.
- Now to distribute this channel to users many channel signal must put into one single cable. So multiplexer gives one output from many signal.

Need of attenuator:

- To equalize the signal
- To mix the signal at different proportion
- Reduces distance by specific value which is express in dB

d) Compare mono amplifier and stereo amplifier.

Ans : **(any four relevant points-1 mark each)**

SR.No	Stereo amplifier	Mono amplifier
1	Stereo means solid and phone is sound in Greek, means three dimensional sound.	Mono means one sound or one dimensional sound.
2	Sound arises from the two different amplifiers so that sound appears to be surrounded.	Monophonic sound system has one source
3	It has two different channels (left and right) corresponds to two amplifiers and loud speakers.	Mono amplifier has one channel and one speaker system.
4	Stereo amplifier scan have multispeaker system which gives surround system.	Multiloud speakers can be connected but with same source.
5	With stereo system sound reproduced is actual feels original	The monophonic sound is cheap to be produced but lacks naturalness.
6	Used in Hi-Fi amplifier system.	Used in public address system.

e) Draw composite video signal with label.

Ans : (Diagram-3 marks & label-1 mark)